Complete Listing of Claims

This listing of claims will replace all prior versions and listings of claims in the application. Please amend the claims as follows:

1. (Currently Amended) A method of forming a composite material comprising:

combining carbon-containing fibers, a carbonizable matrix material which includes a thermoplastic pitch, and a ~~thermoplastic~~ friction additive to form a mixture;

heating the mixture to a sufficient temperature to melt at least a portion of the matrix material, the step of heating including:

applying an electric current to the mixture to generate heat within the mixture; and

while heating the mixture, applying a pressure of at least 35 kg/cm^2 to the mixture to form a compressed composite material.

2. (Original) The method of claim 1 wherein said additive comprises at least one of carbides, oxides, isotropic coke, and combinations thereof.

3. (Original) The method according to claim 1 wherein said additive comprises at least one of an oxide or carbide of silicon, boron, titanium, molybdenum, vanadium, chromium, hafnium, zirconium, tungsten, and combinations thereof.

4. (Original) The method according to claim 1 wherein said additive comprises particles of at least one of SiC, SiO_2, and combinations thereof.

5. (Original) The method according to claim 2 wherein said additive comprises said oxide and further comprising heat treating said compressed composite material to sufficient temperature for a sufficient period of time to convert said oxide to a carbide.

6. (Original) The method according to claim 5 further comprising impregnating said compressed composite material with a carbonizable material.

7. (Original) The method of claim 1, wherein the step of heating and applying pressure comprises heating the mixture to a temperature of at least 500 °C to form a compressed composite material having a density of at least about 1.3 g/cm^3 within thirty minutes.

8. (Original) The method of claim 1, wherein the carbon-containing fibers include at least one of mesophase pitch based carbon fibers, polyacrylonitrile carbon fibers, and combinations thereof.

9. (Original) The method of claim 1, wherein the matrix material comprises finely divided pitch.

10. (Original) The method of claim 1, wherein the step of heating comprises:

heating the mixture for a first period of time at a first temperature by applying a first power level; and

heating the mixture for a second period of time at a second temperature higher than the first temperature by applying a second power level higher than the first power level.

11. (Original) The method of claim 1, wherein the step of combining comprises combining about 20-77% by weight of said carbon-containing fibers with about 50-20% by weight of said carbonizable matrix material and about 3-30% by weight of said additive.

12. (Original) The method of claim 1, further comprising:

increasing the density of the compressed composite by introducing a carbonizable material into voids in the compressed composite and then baking the compressed composite to achieve a density of at least about 1.6 g/cm^3.

13. (Withdrawn) A method of forming a composite material comprising:

combining carbon-containing fibers and a carbonizable matrix material to form a mixture;

heating the mixture to a sufficient temperature to melt at least a portion of the matrix material and remove at least a portion of volatile components from the matrix material, the step of heating including:

applying an electric current to the mixture to generate heat within the mixture;

while heating the mixture, applying a pressure of at least 35 kg/cm^2 to the mixture to form a compressed composite material; and

impregnating said compressed composite with a friction additive.

14. (Withdrawn) The method according to claim 13 wherein said additive comprises at least one of a carbide, an oxide, isotropic coke, and combinations thereof.

15. (Withdrawn) The method according to claim 13 wherein said impregnating comprises incorporating said additive into said compressed composite material under vacuum.

16. (Withdrawn) The method according to claim 13 wherein said additive comprises a colloidal suspension comprises of an oxide in a liquid carrier and a concentration of said oxide in said carrier comprise at least about 20% up to about 75% by weight.

17. (Withdrawn) The method according to claim 16 further comprising treating said compressed composite material to substantially remove said carrier from said compressed composite material.

18. (Withdrawn) The method according to claim 16 further comprising heat treating said compressed composite material to sufficient temperature for a sufficient period of time to convert said oxide to a carbide.

19. (Currently Amended) A method of forming a composite material suitable for vehicle brakes comprising the steps of:

a) compressing a mixture of carbon fibers, a matrix material which includes a thermoplastic pitch, and a ~~thermoplastic~~ friction additive, wherein said additive comprises at least one of a carbide, an oxide, isotropic coke, and combinations thereof;

b) during the step of compressing, applying a current to the mixture, the mixture providing a sufficient electrical resistance to the current such that the mixture reaches a temperature of at least 500 °C to form a compressed preform;

c) introducing a carbonizable material into the compressed preform to form an impregnated preform;

d) optionally, baking the product of step c) to carbonize the carbonizable material;

e) optionally repeating step c) and step d); and

f) graphitizing the impregnated preform to a final temperature of at least about 1500 °C to form the composite material, the graphitized preform having a density of at least about 1.7 g/cm^3 if step c) is repeated no more than once.

20. (Withdrawn) A method of forming a composite material suitable for vehicle brakes comprising the steps of:

a) compressing a mixture of carbon fibers and a matrix material which includes pitch;

b) during the step of compressing, applying a current to the mixture, the mixture providing a sufficient electrical resistance to the current such that the mixture reaches a temperature of at least 500 °C to form a compressed preform;

c) introducing a carbonizable material into the compressed preform to form an impregnated preform;

d) optionally, baking the product of step c) to carbonize the carbonizable material;

e) impregnating said compressed composite within a friction additive, wherein said additive comprises at least one of a carbide, an oxide, isotropic coke, and combinations thereof;

f) optionally repeating step c) and step d); and

g) graphitizing the impregnated preform to a final temperature of at least about 1500 °C to form the composite material, the graphitized preform having a density of at least about 1.7 g/cm^3 if step c) is repeated no more than once.